

**Seventh SG13 Regional Workshop on  
“Standardization of Future Networks towards  
Building a Better Connected Africa”**

**Cloud Computing and Big Data Analytics**

**Abuja, Nigeria, 3-4 February 2020**

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# WHAT IS CLOUD COMPUTING?

Cloud computing is an “on-demand” service for the delivery of computing—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet (“the cloud”) to offer faster innovation, flexible resources, and economies of scale.

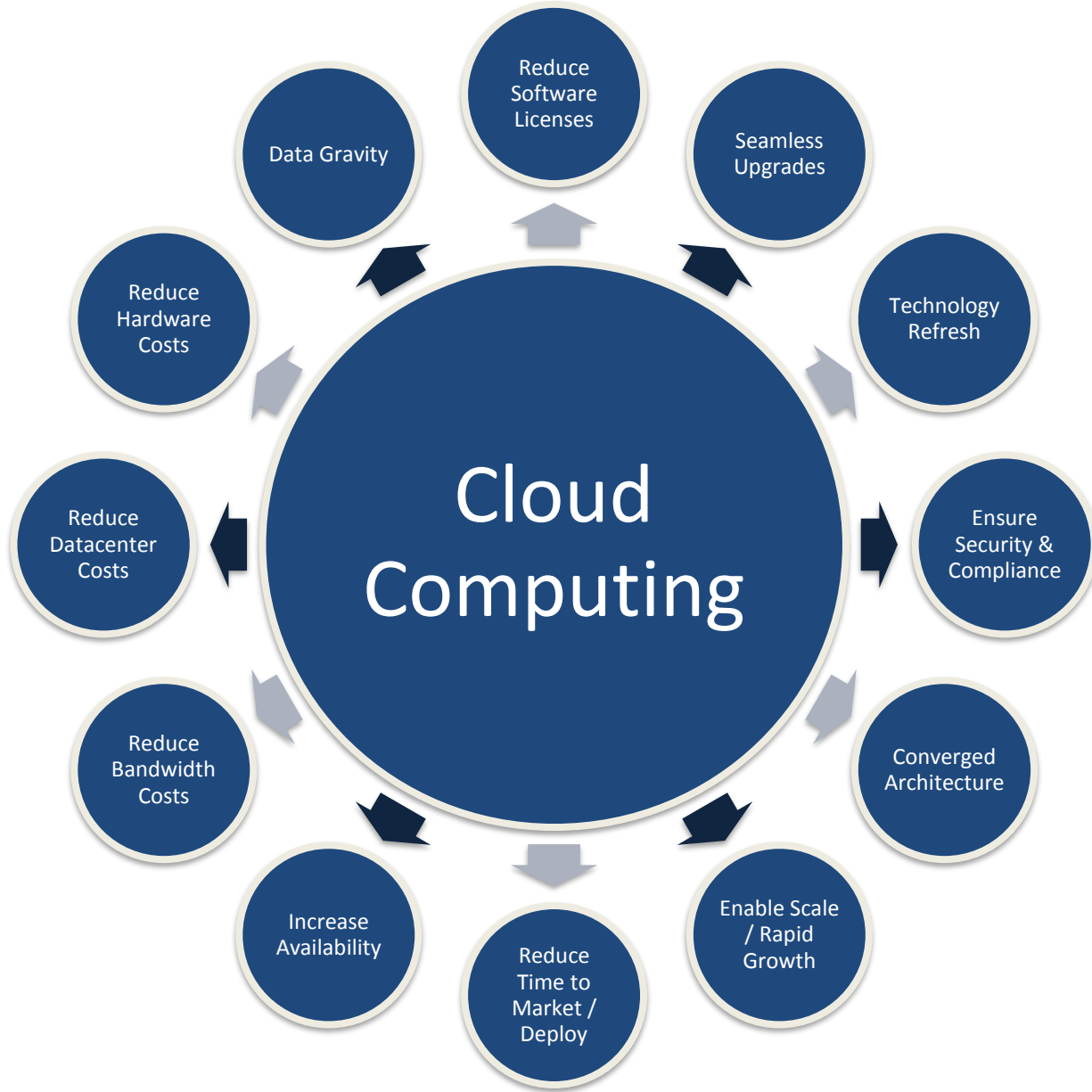
It is a Pay-as-you go model helping users to lower operational costs of running their own infrastructure efficiently with the ability to scale easily.



Image Source: [www.linuxnix.com](http://www.linuxnix.com)



# DRIVERS FOR CLOUD COMPUTING



# BENEFITS OF CLOUD COMPUTING



REDUCE COST



SPEED OF  
DEPLOYMENT



INCREASED  
PRODUCTIVITY



RELIABILITY



PERFORMANCE



SECURITY



GLOBAL SCALE

# MORE BENEFITS OF CLOUD COMPUTING

**CLOSE TO ZERO CAPEX  
INVESTMENT & REDUCED TOTAL  
COST OF OWNERSHIP**

**REDUCED TIME TO MARKET /  
TIME TO DEPLOY/GLOBAL SCALE**

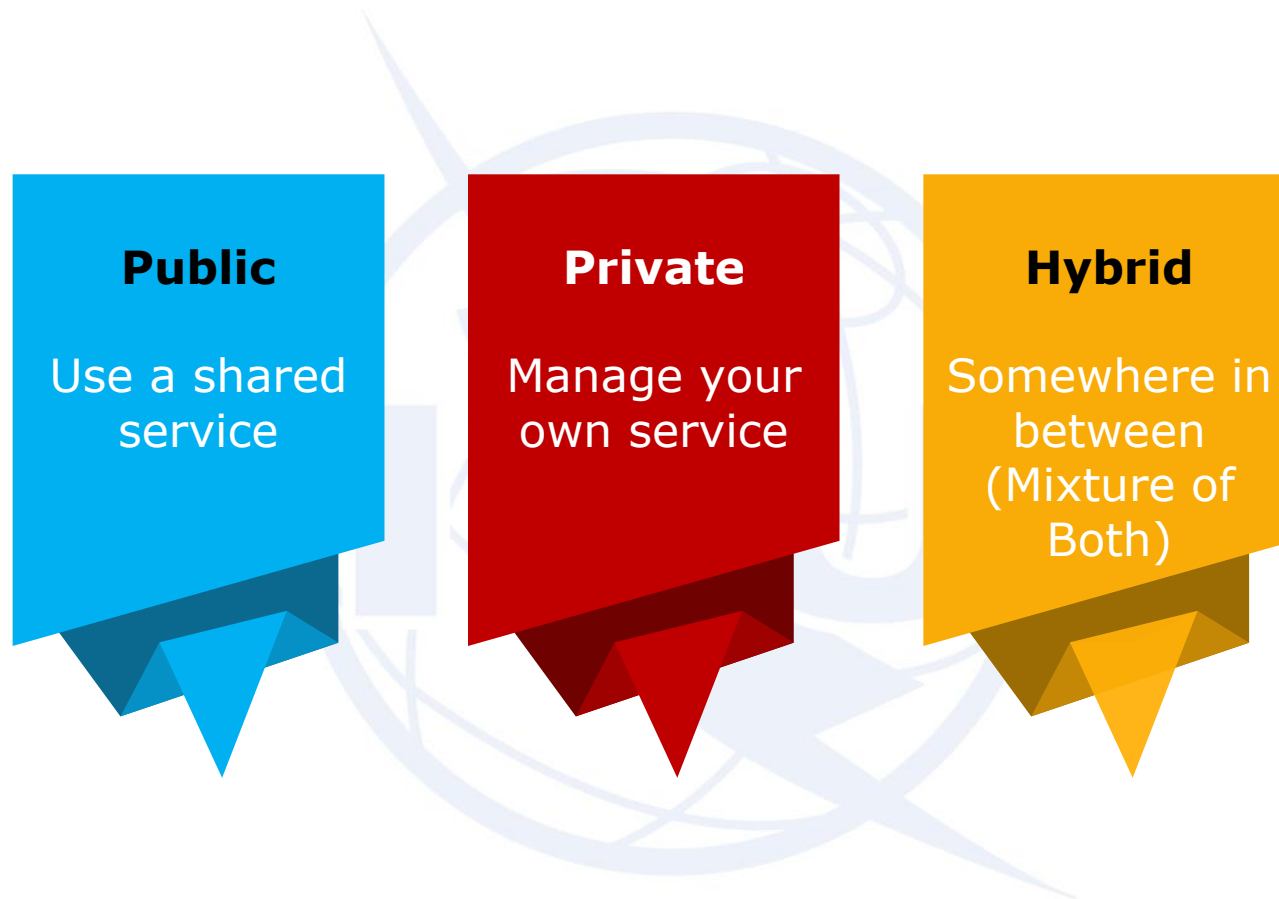
**EASY SCALABILITY & MORE  
EFFECTIVE RESOURCE  
UTILIZATION**

**SECURE ENVIRONMENTS  
WITH MULTI-TENANT ISOLATION**

**FOCUS ON YOUR CORE  
BUSINESS/INCREASED  
PRODUCTIVITY**



# TYPES OF CLOUD COMPUTING 1/2



# TYPES OF CLOUD COMPUTING 2/2

## **Public Cloud;**

Are owned and operated by third-party cloud service providers, which deliver their computing resources like servers and storage over the internet. Azure, AWS, Alibaba and Google Cloud are examples.

## **Private Cloud;**

The private cloud is defined as computing services offered either over the Internet or a private internal network and only to select users instead of the general public

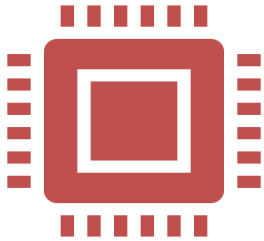
## **Hybrid clouds;**

This is the combination of public and private clouds, integrated together by technology that allows data and applications to be shared between them. A hybrid solution gives businesses greater flexibility and more deployments options, optimization and security compliance.





# TYPES OF CLOUD SERVICES



## IaaS

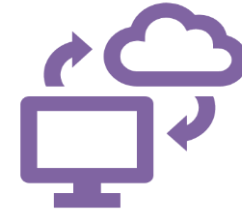
Here the service provider offers entire infrastructure along with the maintenance related tasks.

The most basic category of cloud computing services. With IaaS, you rent IT infrastructure—servers and virtual machines (VMs), storage, networks, operating systems—from a cloud provider on a pay-as-you-go basis



## PaaS

Platform as a service refers to cloud computing services that supply an on-demand environment for developing, testing, delivering and managing software applications. PaaS is designed to make it easier for developers to quickly create web or mobile apps, without worrying about setting up or managing the underlying infrastructure of servers, storage, network and databases needed for development.



## SaaS

Software as a service is a method for delivering software applications over the Internet, on demand and typically on a subscription basis. With SaaS, cloud providers host and manage the software application and underlying infrastructure and handle any maintenance, like software upgrades and security patching.

# TYPES OF CLOUD SERVICES

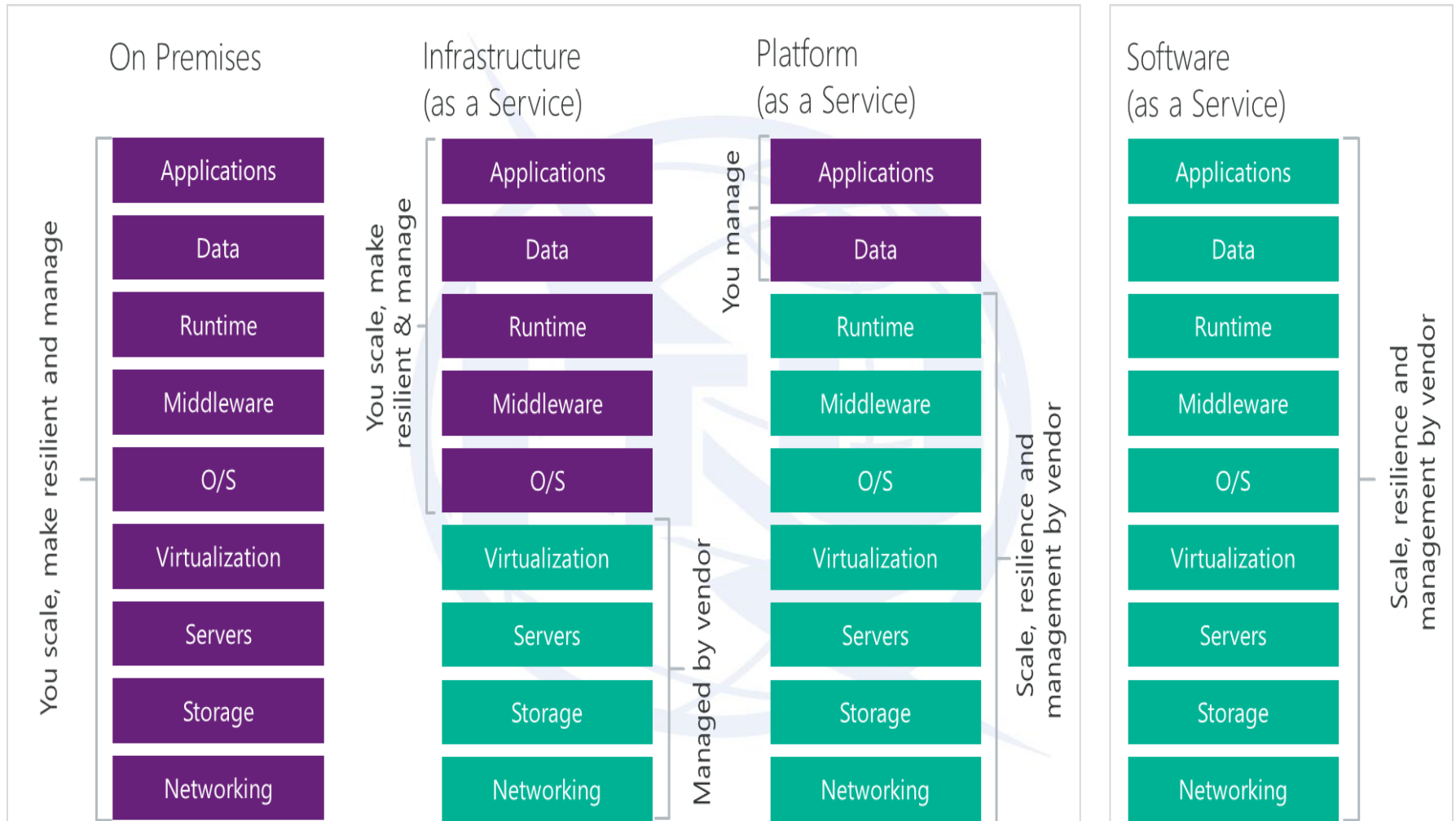


Image Source: [www.researchgate.net](http://www.researchgate.net)



# PROS AND CONS OF THE TYPES OF CLOUD SERVICES

	Public	Private	Hybrid
Pros	<ul style="list-style-type: none"><li>Easy to use</li><li>Wider adoption</li><li>Generally Cheaper</li><li>Zero Maintenance concerns</li><li>Newest version always</li></ul>	<ul style="list-style-type: none"><li>Bespoke Solution</li><li>Specific tool to you</li><li>Can be a unique advantage</li><li>On your terms, all the time</li><li>Generally perceived to be more secure</li></ul>	<ul style="list-style-type: none"><li>Somewhere in between</li><li>Seeks to provide a shared platform for companies to build bespoke solutions</li></ul>
Cons	<ul style="list-style-type: none"><li>Difficult to add new features</li><li>Privacy concerns</li></ul>	<ul style="list-style-type: none"><li>Expensive to procure &amp; maintain</li><li>Slower evolution than public alternatives</li></ul>	<ul style="list-style-type: none"><li>Only goes so far...</li><li>Shares both benefits &amp; disadvantages of previous models</li></ul>

# TYPES OF CLOUD COMPUTING PLATFORMS

Most Companies support the multi-cloud platform with virtual data localization in compliance with local laws for Data Domiciliation. E.g NITDA NPDR Policy

MULTI CLOUD



HYBRID

Azure Stack

Traditional IT

TRADITIONAL



## What is Multi-Cloud & why?

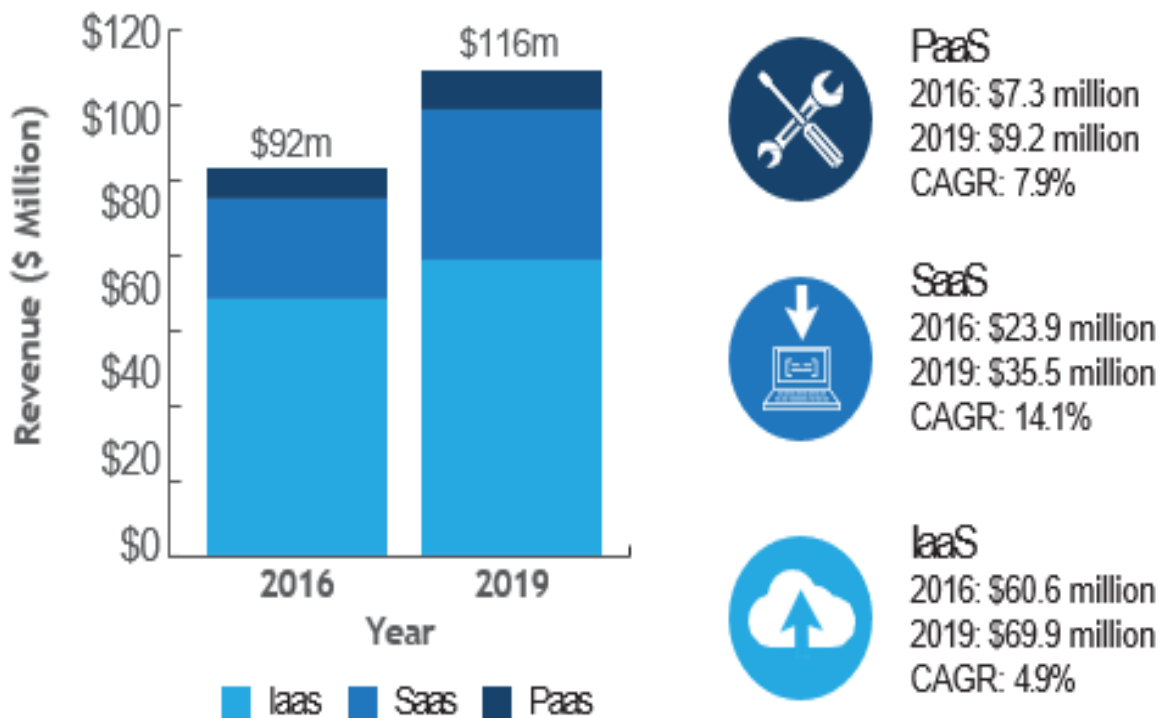
- Providing solutions using two or more public or private clouds to achieve the enterprise end goals
- Different cloud optimized for different services – best of all class.
- Multi-cloud solution uses different providers to meet specific workload requirements, and aren't necessarily connected to each other
- Avoids dependence on a single cloud provider
- Challenge - integration is difficult across the various cloud servers and additional security challenges

# CLOUD MARKET IN NIGERIA

- Public Sector Cloud Adoption is still Low.
- Private Sector embracing more of Collocation than Local Cloud Providers or hosting on Public Cloud.
- Anxiety over Safety and Security of Data stalling Cloud Growth
- Government Enforcement can enable cloud services through;
  - ✓ Content/Data localization
  - ✓ Ease of doing business
  - ✓ Enhancing our local Capability

# CLOUD REVENUE PERFORMANCE IN NIGERIA

- Bulk of Revenue goes to global cloud service providers who have a large base of local and foreign resellers offering their retail and enterprise solutions to Nigerian enterprises businesses
- Service uptake is led by Financial Services, Public Sector, Oil & Gas and Manufacturing



Source: Frost & Sullivan



# CLOUD COMPETENCY AVAILABLE IN MDXI, NIGERIA



## WEST AFRICA'S PREMIER SOLUTION PROVIDER

Proven Connectivity Partner to 500+ Businesses  
 Experience providing in-country Cloud services to a rich ecosystem of customers for over 3 years

### Our Certifications

ISO 9001 &  
 ISO 27001

PCI-DSS  
 Certified v3.2

Certified Tier III  
 Design Facility

Certified Tier III  
 Constructed Facility

TIA 942 & Uptime  
 Tier III Standards

SAP Certified Cloud  
 & Infrastructure

Microsoft  
 Gold Partner

AWS Consulting  
 Partner

- MDX-I in-country data centers and Cloud platform offers compliance to sovereignty laws and compliance as data remains in-country, backed by our pool of highly skilled in-country operational teams who monitor, operate and maintain your infrastructure to ensure consistent uptime 24 X 7 X 365.
- A hybrid cloud platform that is truly consistent with a major public cloud provider and unlocks this enterprise value.



# CASE STUDY 2: PRIVATE CLOUD DEPLOYMENT FOR CAC BUSINESS REGISTRATION PLATFORM.

## Business Challenge

With 4 weeks to assessment by world bank, there were availability issues on many levels and no clear governance policy in place.

Frequent incidents and application downtime, with unclear root cause analysis.

Finger pointing among multiple vendors

## MDX-I Solution

Provisioning of secure infrastructure with guaranteed 99.9% availability hosted at the MDX-i Data Center.

ITIL-based infrastructure management for OS, Database and Middleware

## Outcome

Better Application Availability  
Drastically reduced time to register new business.

Passed the World bank assessment and moved up in ease of doing business ranking





# CASE STUDY 1: OFFSHORE DISASTER RECOVERY ON AZURE FOR LARGE RETAIL STORE.

## Business Challenge

Failure of existing backup solution following as data loss to fire incident in the primary location.

To meet industry compliance, customer needed a completely separate disaster recovery infrastructure outside of the geographic area.

Budget constraints.

## MDX-I Solution

Fully redundant hybrid and DR environment for the retail System  
Comprehensive deployment of Azure Site Recovery (ASR) and Azure Backup solution for on-premise hyper-V based IT environment.

Ongoing Managed Services that includes proactive replication and backup monitoring, and periodic

## Outcome

DR Solution was deployed in-time and within budget.

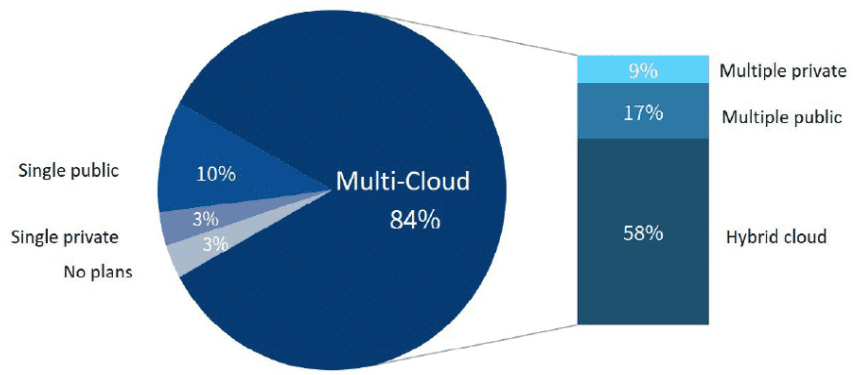
Significantly improved the reliability of the retail system, which means easier access to records, and ability to spin up new resources almost instantly, avoiding the huge delays involved if it had kept its DR systems solely on-premises.



# SURVEY ON GLOBAL ENTERPRISE CLOUD STRATEGY

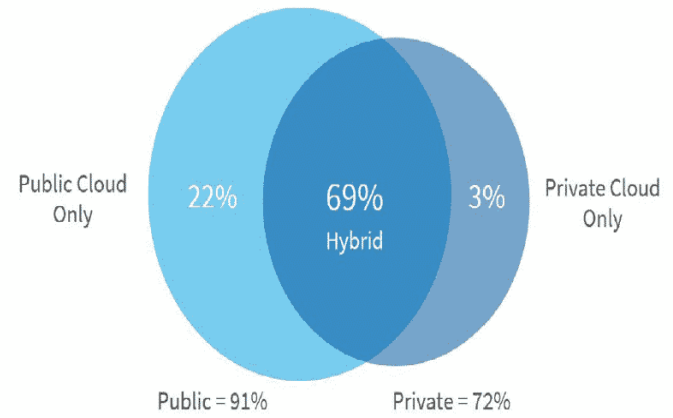
## Enterprise Cloud Strategy

1000+ Employees



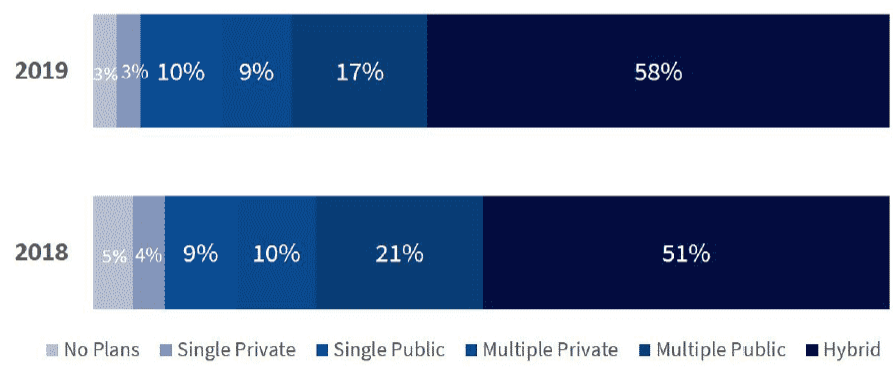
Source: RightScale 2019 State of the Cloud Report from Flexera

## 94% of Respondents Using Cloud



Source: RightScale 2019 State of the Cloud Report from Flexera

## Enterprise Multi-Cloud Strategy YoY



Source: RightScale 2019 State of the Cloud Report from Flexera



# WHAT IS BIG DATA ?

“Big Data is a field that treats ways to analyze data sets that are too large or complex to be dealt with by the traditional data processing technique”

Data > 1TB

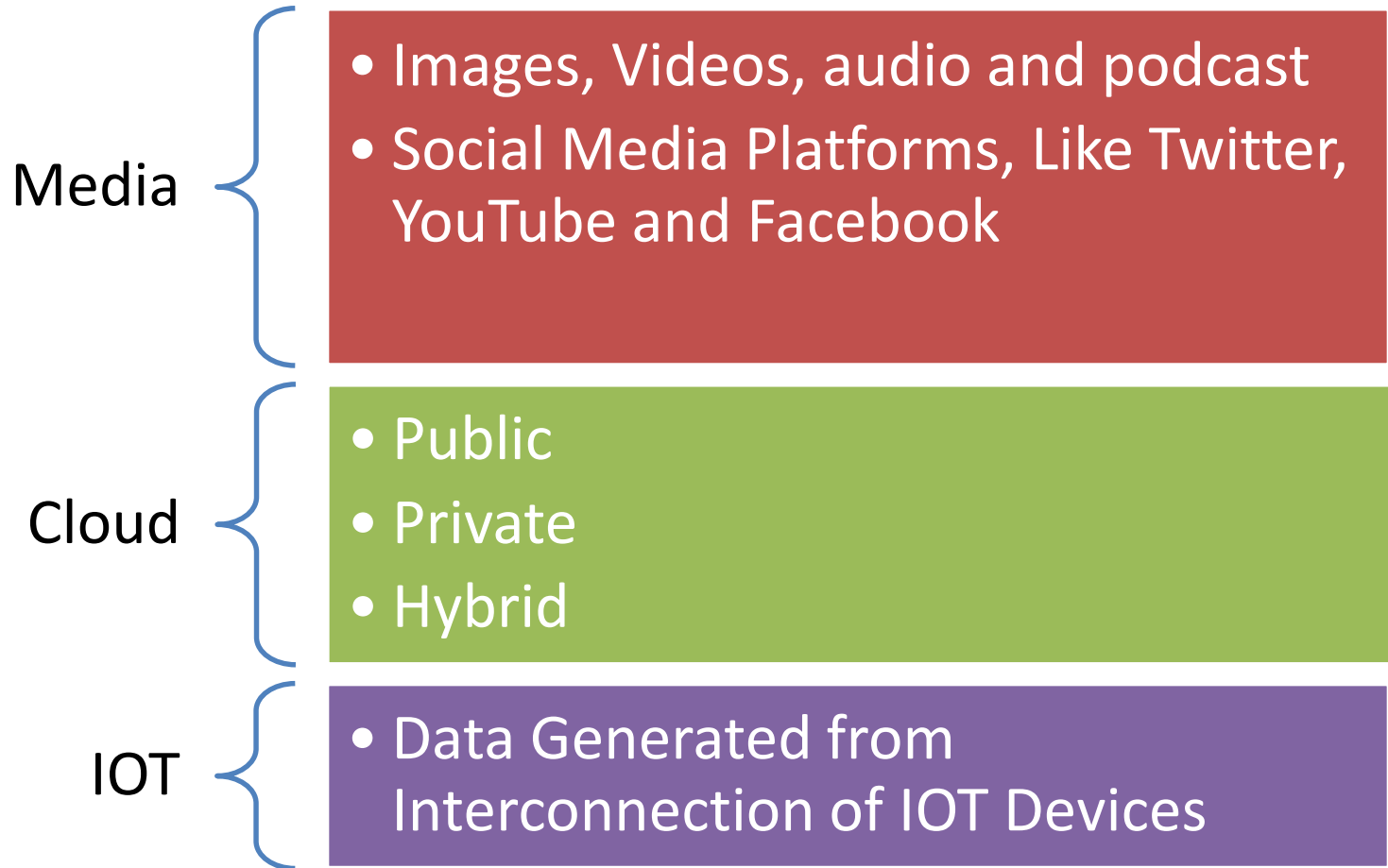
# BIG DATA = BIG IMPACT...

“By 2020, the market size of the third IT platform (big data, cloud computing, mobile Internet and social business) will reach US \$5.3 trillion. And from 2013-2020, 90% of the growth in IT industry will be driven by the third IT platform”

*Source: International Data Corporation (IDC)*



# SOURCES OF BIG DATA



# EVOLVING DATA CONSUMPTION IN 60 SECONDS



"2.1 Million Snaps"

facebook

1 Million logging in

YouTube

4.5 Million Videos viewed



87,500 People Tweeting

Google

3.8 Million Search Queries



188 Million Emails Sent

NETFLIX

694,444 Hours Watched

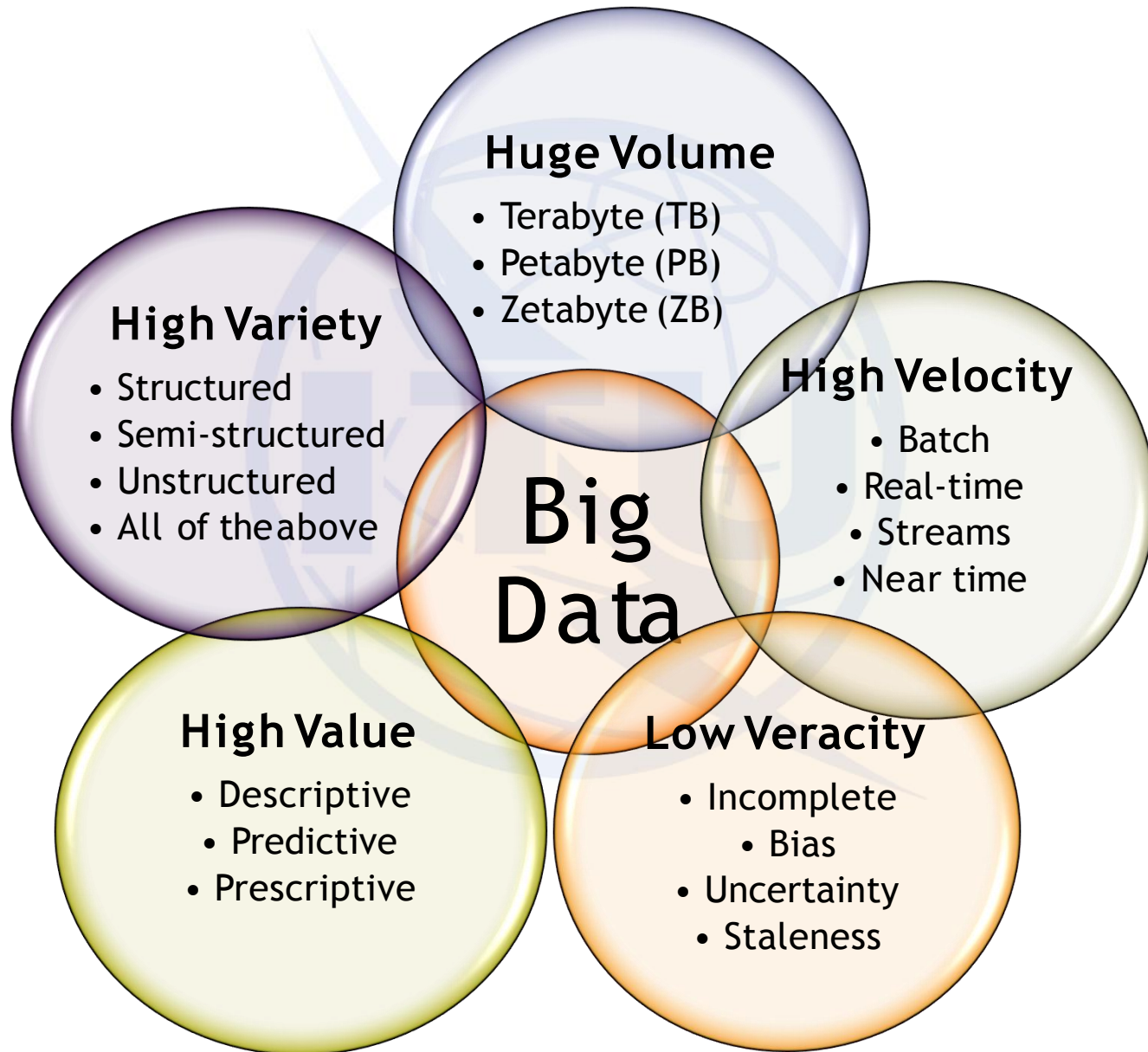
## 2019 *This Is What Happens In An Internet Minute*



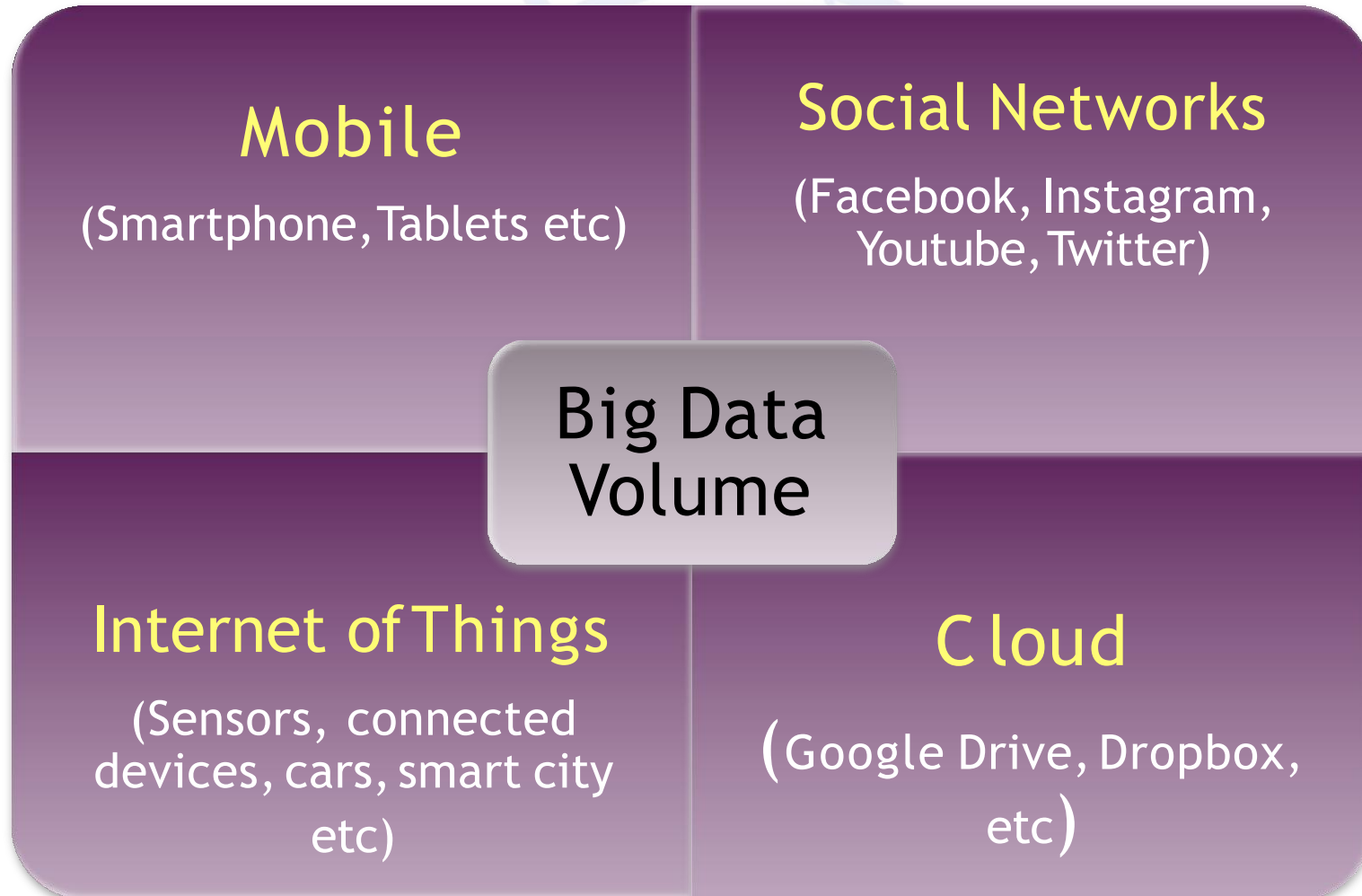
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@LoriLewis  
@OfficiallyChadd



# THE 5VS OF BIG DATA

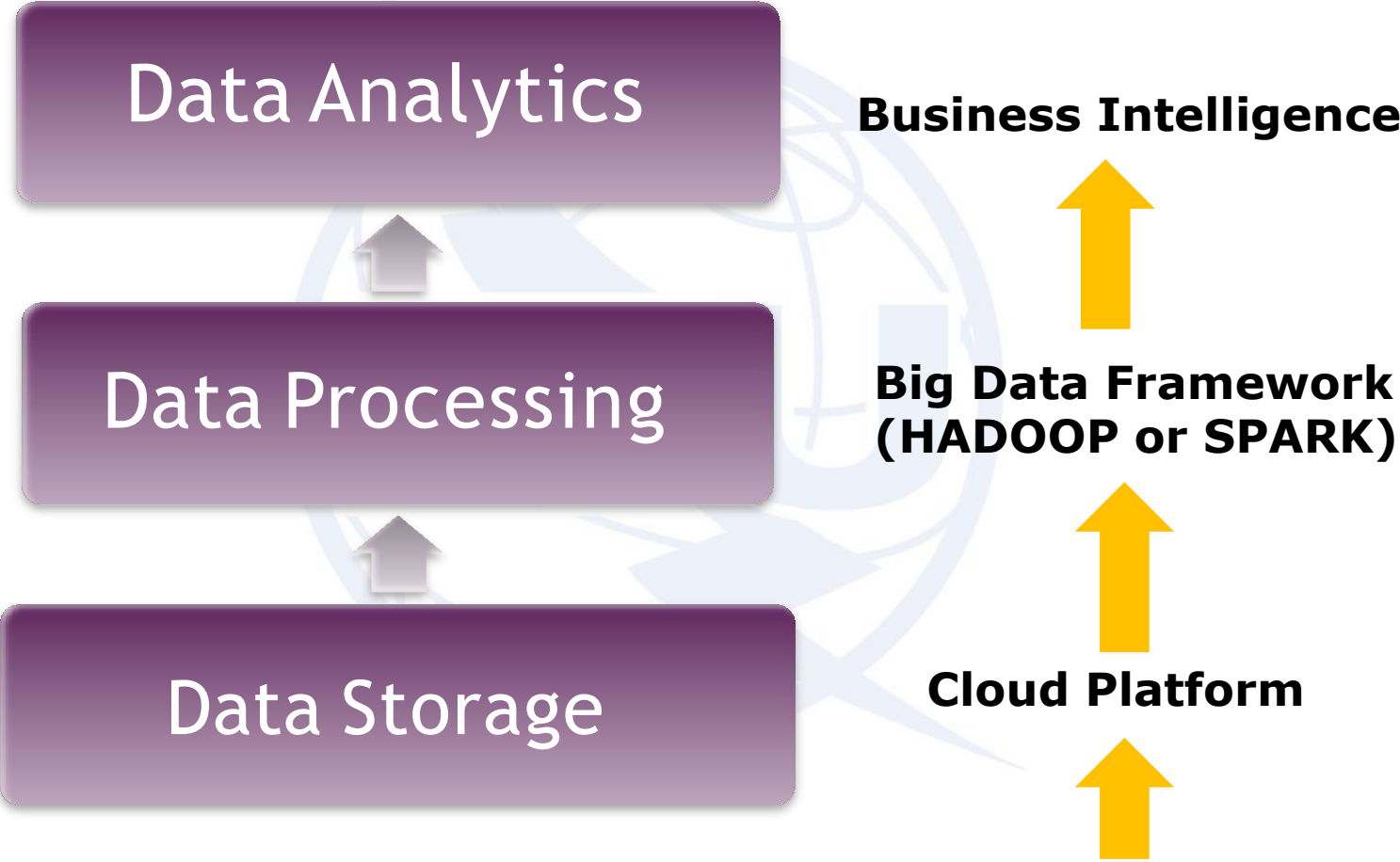


# KEY TECHNOLOGY TRENDS & DRIVERS OF BIG DATA





# BIG DATA FLOW



# BIG DATA & CLOUD COMPUTING: PERFECT RELATIONSHIP

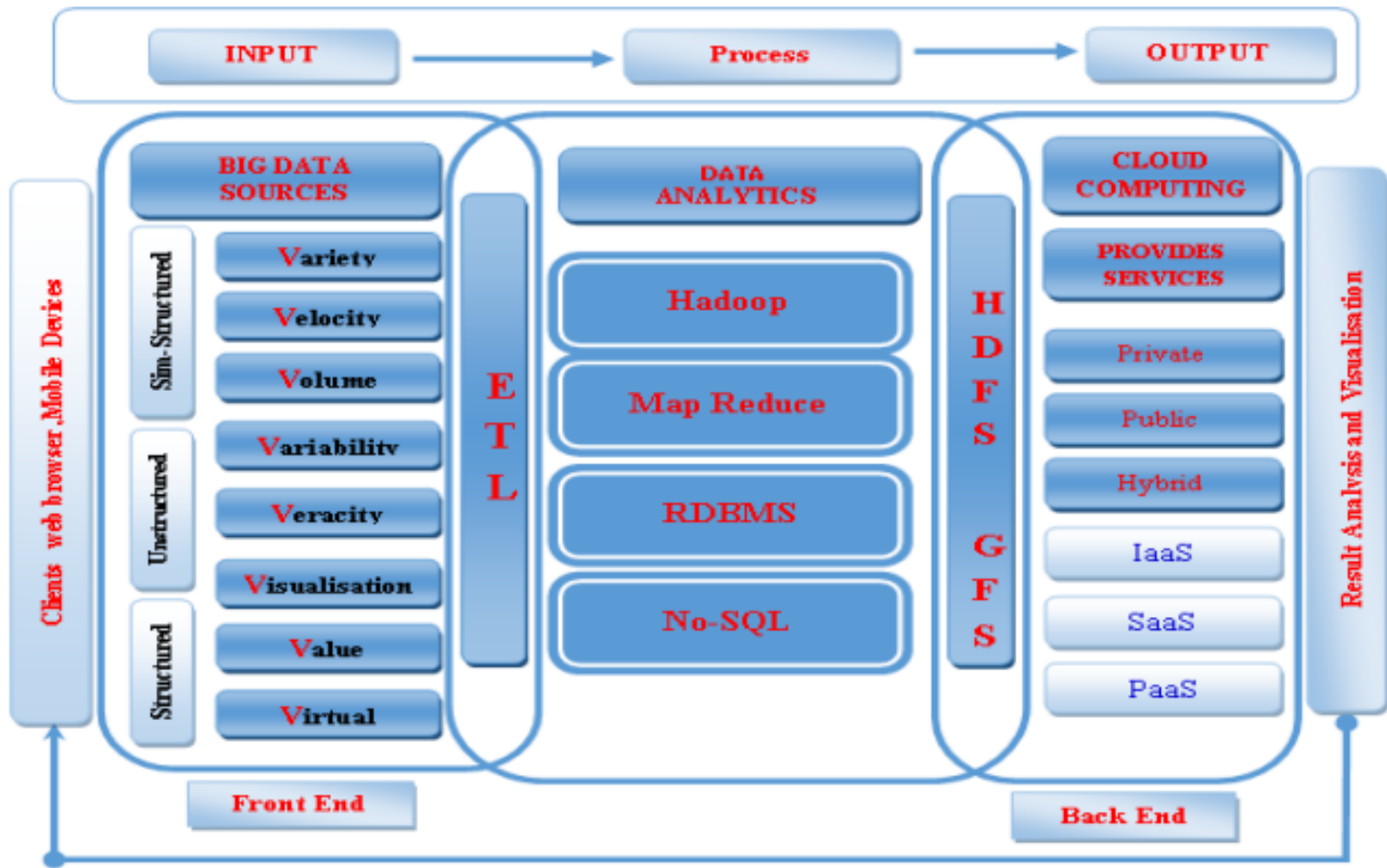


Figure 3. A Model Showing The Relationship Between Big Data And Cloud Computing

# BIG DATA: FRAMEWORK

HADOOP



SPARK



CASSANDRA



# HADOOP VS SPARK

<b>Factors</b>	<b>HADOOP</b>	<b>APACHE SPARK</b>
<b>Speed</b>	Faster than Traditional System	100 x times than Hadoop/MapReduce
<b>Programming Language</b>	Java	Scala
<b>Data Processing</b>	Batch Processing	Batch/Real-time/Iterative/Interactive/Graph
<b>Ease Of Use</b>	Complex and Lengthy	Compact & Easier than Hadoop
<b>Caching</b>	Doesn't support Caching of Data	Caches the data In-memory & enhances the system performance
<b>Processing Model</b>	On-Disk(Disk-based Parallelization), Batch	In-Memory, On-Disk, Batch, Interactive, Streaming (Near Real-Time)
<b>API</b>	Java, Python, Scala, User Facing	Scala, Java, Python, Use-Facing
<b>Libraries</b>	None, Separate Tools	Spark Core, Spark Streaming, Spark SQL, MLlib, GraphX
<b>License</b>	Open Source Apache 2.0, Version 2.x	Open Source Apache 2.0, Version 1.x
<b>Cost</b>	Low Cost	High Cost



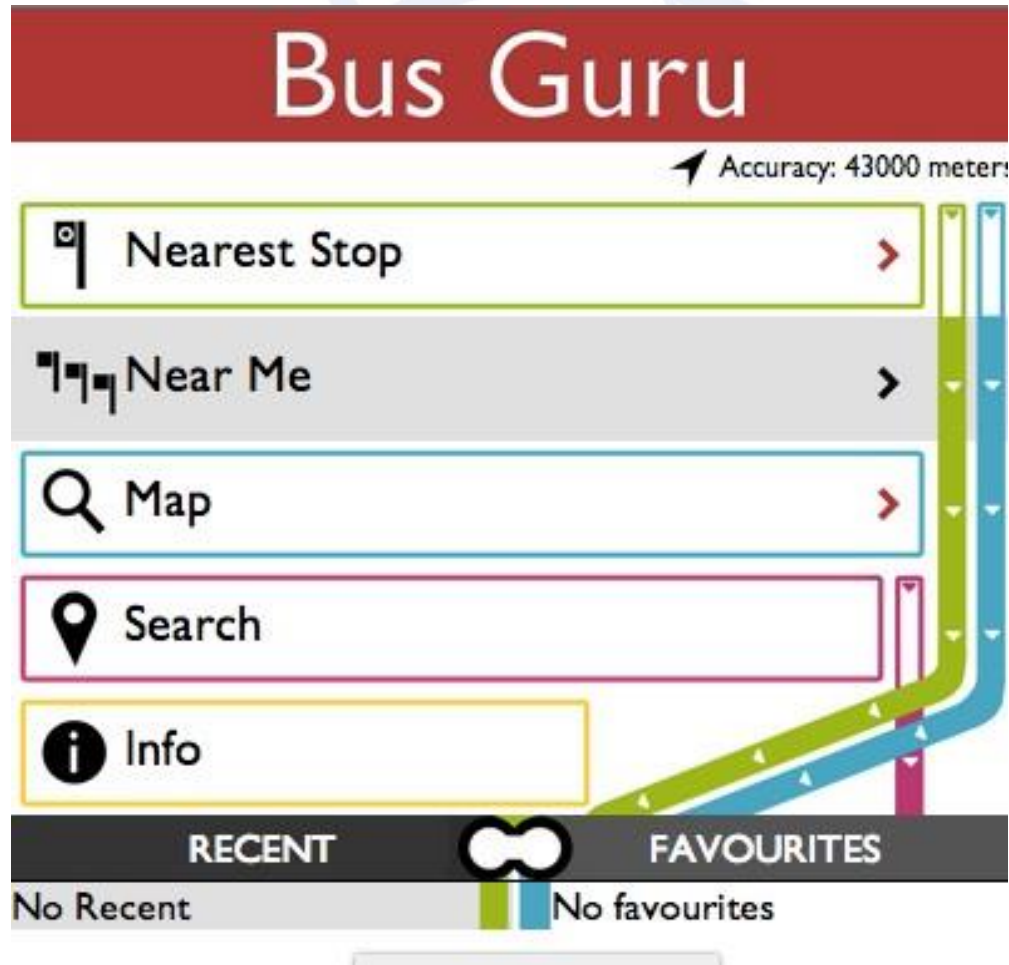
# CASE STUDY: SAN-FRANCISCO RECREATIONS AND PARKS

Helps people find and navigate thousands of parks, playgrounds, museums, recreation centers, gardens, public restrooms and other points of interest and facilities that are maintained by the city of San Francisco



# CASE STUDY: BUS GURU, LONDON

Bus Guru is an iOS app that pulls in data from Transport for London, giving commuters real-time bus options, journey times and estimated time of arrival at a given station.



# BIG DATA GOVERNANCE

“Big Data Governance is the process and management of **data availability**, **usability**, **integrity** and **security of data** used in an enterprise. It Involves all the steps from housing the data to securing it form any **Calamity**. It is very important to ensure vital data are protected and managed.

# BIG DATA GOVERNANCE & POLICIES

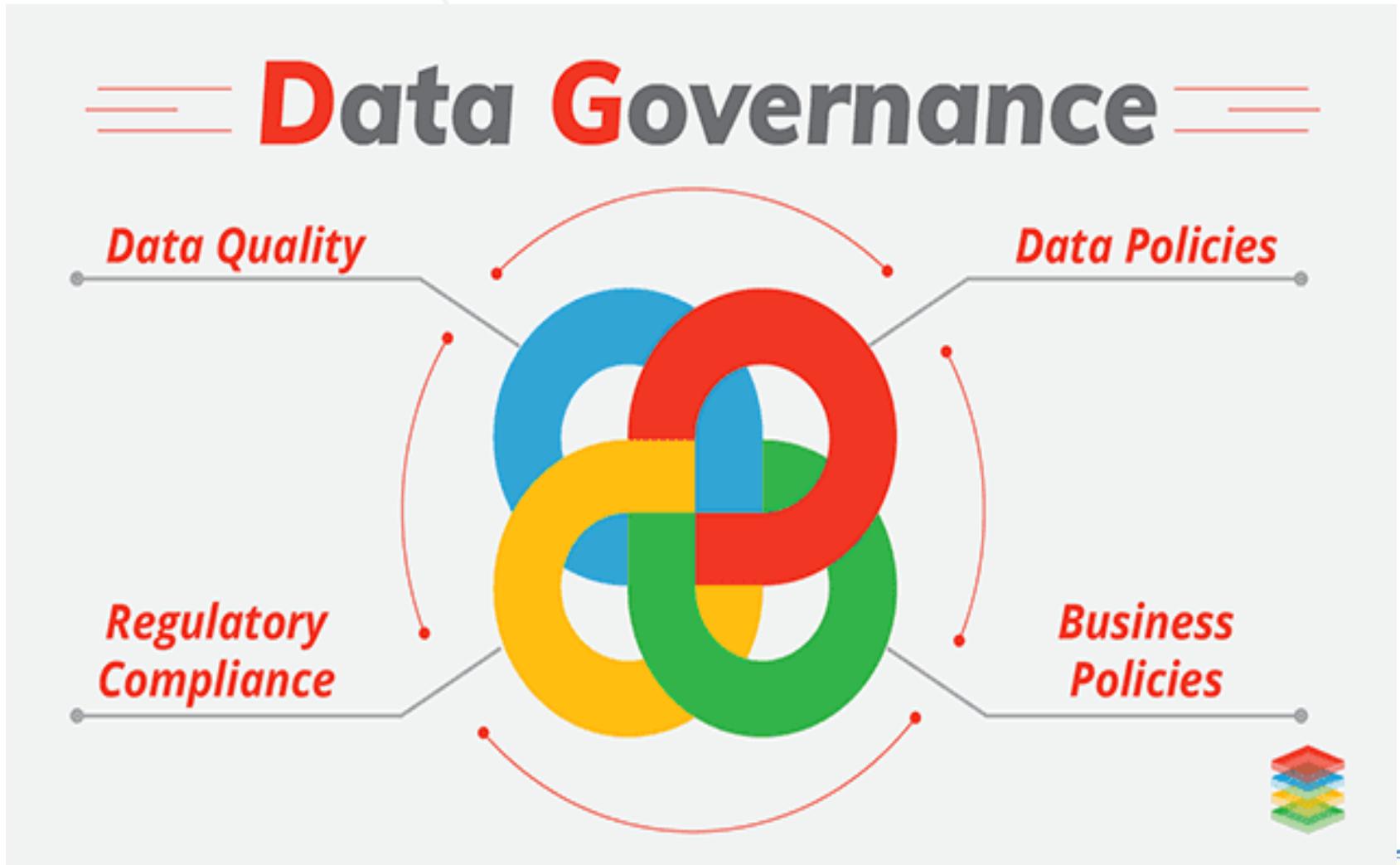


Image Source: <https://www.xenonstack.com/>



# DATA REGULATIONS

Examples:

**GDPR:** General Data Protection Regulation

**NDPR:** Nigeria Data Protection Regulation



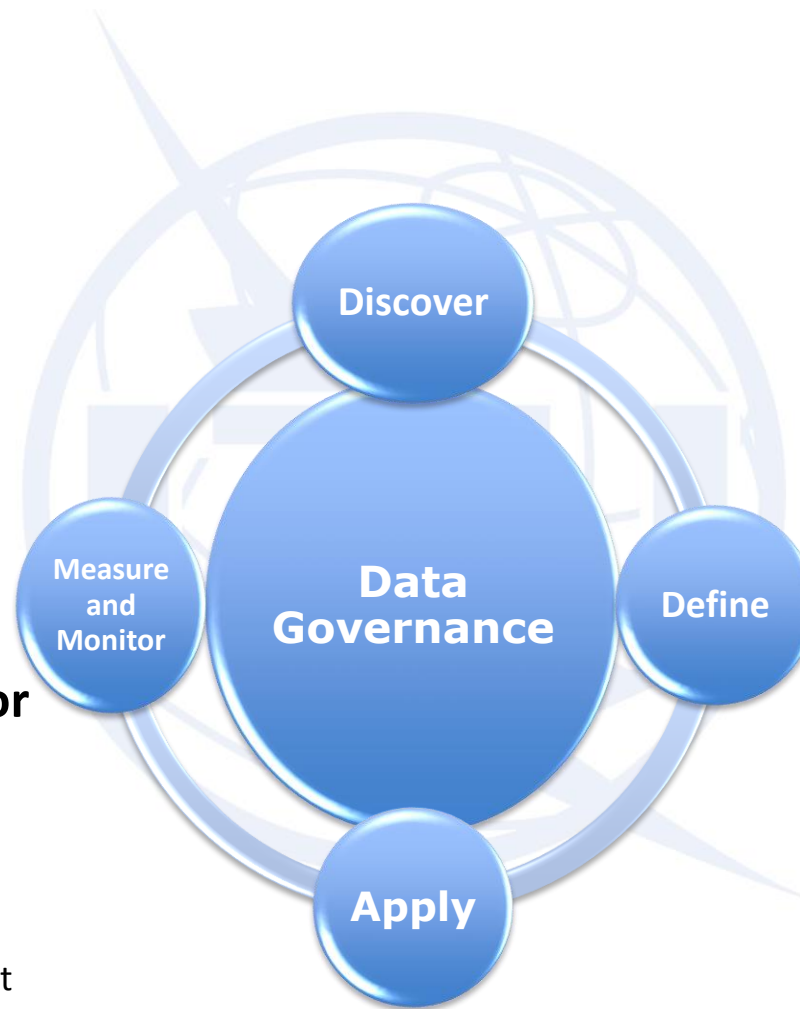
# DATA GOVERNANCE FLOW

## Discover:

- Data discovery
- Data profiling
- Data Inventories
- Capability assessment

## Measure and Monitor

- Proactive monitoring
- Operational dashboards
- Program Performance
- Business value/ROI
- Dashboards monitoring/audit
- Reactive operational DQ audits



## Define

- Business glossary creation
- Data classifications
- Data relationships
- Reference data
- Business rules
- Data Governance policies
- Other dependent policies
- Key Performance Indicators

## Apply

- Automated rules
- Manual rules
- End to end workflows
- Business/IT Collaboration